

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A simulator is for debugging a mechanism control program, the mechanism control program being used for controlling a mechanism which performs a mechanical operation and a hardware which drives and controls the mechanism, the simulator comprising:

a simulation CPU;

~~a memory write accessible from one of said simulation CPU and a control CPU connected to said simulator and read accessible from the other;~~

~~means for causing said simulation CPU to read out control information written in said memory by the control CPU; and~~

~~means for writing an execution result of execution of simulation based on the control information in said memory in a state readable by the control CPU~~

a command information storing section for storing command information based on the mechanism control program, the command information being used for driving and controlling the mechanism and being readable by the simulation CPU;

pseudo-operation means for simulating an operation of the mechanism and an operation of the hardware used to drive and control the mechanism, when the simulation CPU reads the command information from the command information storing section;

a sensor information storing section for storing sensor information obtained as an operation result of the mechanism when the pseudo-operation means operates, the sensor information being readable by the mechanism control program; and

a response information storing section for storing response information indicative of an operation result of the pseudo-operation means, the response information being readable by the mechanism control program.

2. (Currently Amended) A simulator according to claim 1, wherein
said simulator further comprises connection means for connecting said simulation CPU to ~~said memory~~ the command information storing section, the sensor information storing section and the response information storing section, and

~~the control information~~ the command information is read out from ~~said memory~~ the command information storing section ~~or, the execution result~~ the sensor information is written in ~~said memory~~ the sensor information storing section, and the response information is written in the response information storing section through said connection means.

3. (Currently Amended) A simulator according to claim 1, wherein after ~~the execution result of the simulation~~ the sensor information is written in ~~said memory~~, the sensor information storing section and the response information is written in the response information storing section, an interrupt is requested of the control CPU.

4. (Original) A simulator according to claim 3, further comprising
count means for counting the interrupt, and
transmission means for transmitting timeout data on the basis of a count value of said count means.

5. -10. (Cancelled)

11. (Currently Amended) A simulator according to claim ~~10~~1, further comprising
~~a third memory~~ a port information storing section in which output port ON/OFF information is written by the control CPU, and
means for reading out the output port ON/OFF information from ~~said third memory~~
the port information storing section.

12. – 13. (Cancelled)

14. (Currently Amended) A simulation method for debugging a mechanism control program, the mechanism control program being used for controlling a mechanism which performs a mechanical operation and a hardware which drives and controls the mechanism, the simulation method comprising ~~the steps of:~~

~~causing a control CPU to write control information in a first memory;~~
~~causing a simulation CPU to read out the control information written in the first memory;~~
~~causing the simulation CPU to execute simulation based on the control information;~~
~~causing the simulation CPU to write a simulation result in a second memory; and~~

~~causing the control CPU to read out the simulation result written in the second memory~~

writing command information in a command information storing section based on the mechanism control program, the command information being used for driving and controlling the mechanism and being readable by a simulation CPU;

reading the command information from the command information storing section using the simulation CPU;

simulating an operation of the mechanism and an operation of the hardware used to drive and control the mechanism, when the command information is read out;

writing sensor information in the sensor information storing section, the sensor information being obtained as an operation result of the mechanism when simulation is performed, and being readable by the mechanism control program; and

writing response information in a response information storing section, the response information indicating an operation result of the simulating operation and being readable by the mechanism control program.

15. (Currently Amended) A method according to claim 14, further comprising the step of, after the simulation result the sensor information is written in ~~the second memory~~ the sensor information storing section and the response information is written in the response information storing section, requesting an interrupt of the control CPU.

16. (Currently Amended) A method according to claim 15, further comprising the steps of:

counting the interrupt, and

transmitting timeout data on the basis of a count value of the interrupt.

17. (Cancelled)

18. (Currently Amended) A simulator according to claim ~~17~~1, wherein said simulator further comprises
an address memory for holding a self address in advance, and
comparison means for comparing the self address held in said address memory with a designated address designated ~~on by the main body side~~ the mechanism control program, and

when a comparison result by said comparison means indicates that the addresses match, the sensor information is received, the command information is received, and the response information is sent.

19. (Currently Amended) A simulation system comprising:

a first simulator and a second simulator for debugging a mechanism control program, the mechanism control program being used for controlling a mechanism which performs a mechanical operation and a hardware which drives and controls the mechanism, each being connected to a main body, for simulating operation on a unit side,

said first simulator and said second simulator comprising:

a simulation CPU;

a command information storing section for storing command information based on the mechanism control program, the command information being used for driving and controlling the mechanism and being readable by the simulation CPU;

pseudo-operation means for simulating an operation of the mechanism and an operation of the hardware used to drive and control the mechanism, when the simulation CPU reads the command information from the command information storing section;

a sensor information storing section for storing sensor information obtained as an operation result of the mechanism when the pseudo-operation means operates, the sensor information being readable by the mechanism control program; and

a response information storing section for storing response information indicative of an operation result of the pseudo-operation means, the response information being readable by the mechanism control program,

said first simulator comprising means for receiving sensor information transmitted from said second simulator to ~~said main body side~~ the mechanism control program, and

said first simulator operating in synchronism with said second simulator on the basis of the received sensor information.

20. (Cancelled)

21. (Currently Amended) A system according to claim ~~20~~19, wherein said first simulator and said second simulator comprise ~~comprises~~ a port memory for holding port information transmitted from ~~the main body side~~ the mechanism control program, said port memory being read-accessible from ~~the unit side CPU~~ the hardware.

22. (Currently Amended) A simulator for ~~simulating operation on a unit side in an apparatus which transmits command information from a main body side to the unit side, transmits an execution result of the command from the unit side to the main body side as a response, and transmits sensor information on the unit side to the main body side~~ debugging a first mechanism control program, the first mechanism control program being used for controlling a mechanism which performs a mechanical operation and hardware which drives and controls the mechanism, the simulator comprising:

~~a first command memory for holding command information transmitted from said main body side via a first series, said first command memory being read-accessible from a unit-side CPU;~~

~~a sensor memory in which the sensor information can be written by the unit-side CPU;~~

~~means for transmitting the sensor information written in said sensor memory to said main body side via first series;~~

~~a response memory in which response information can be written by the unit-side CPU;~~

~~means for transmitting the response information written in said response memory to the main body side via said first series; and~~

~~a second command memory for holding command information transmitted from said main body side via a second series, said second command memory being read-accessible from the unit-side CPU~~

a simulation CPU;

a first command information storing section for storing first command information based on the first mechanism control program, the first command information being used for driving and controlling the mechanism and being readable by the simulation CPU;

pseudo-operation means for simulating an operation of the mechanism and an operation of the hardware used for driving and controlling the mechanism, when the simulation CPU reads the first command information from the first command information storing section;

a sensor information storing section for storing sensor information obtained as an operation result of the mechanism when the pseudo-operation means operates, the sensor information being readable by the first mechanism control program;

a response information storing section for storing response information indicative of an operation result of the pseudo-operation means, the response information being readable by the first mechanism control program;

a second command information storing section for storing second command information based on a second mechanism control program different from the first mechanism control program, the second command information being used for driving and controlling the mechanism and being readable by the simulation CPU; and

monitoring means for monitoring the second command information provided by the second mechanism control program when the second command information is read from the second command information storing section by the simulation CPU.

23. (Currently Amended) A simulation system comprising:

a first simulator and a second simulator for debugging a mechanism control program, the mechanism control program being used for controlling a mechanism which performs a mechanical operation and a hardware which drives and controls the mechanism,

said first simulator and said second simulator comprising:

a simulation CPU;

a command information storing section for storing command information based on the mechanism control program, the command information being used for driving and controlling the mechanism and being readable by the simulation CPU;

pseudo-operation means for simulating an operation of the mechanism and an operation of the hardware used to drive and control the mechanism, when the simulation CPU reads the command information from the command information storing section;

a sensor information storing section for storing sensor information obtained as an operation result of the mechanism when the pseudo-operation means operates, the sensor information being readable by the mechanism control program; and

a response information storing section for storing response information indicative of an operation result of the pseudo-operation means, the response information being readable by the mechanism control program,

~~said first simulator comprising means for receiving sensor information transmitted from said second simulator to said main body side via a second series,~~

said first simulator operating in synchronism with said second simulator on the basis of the sensor information,

~~said second simulator comprising means for receiving sensor information transmitted from said first simulator to said main body side via a first series, and~~

said second simulator operating in synchronism with said first simulator on the basis of the sensor information.

24. – 26. (Cancelled)

27. (Currently Amended) A ~~simulation~~ method according to claim 14, wherein said method is applied to a simulation system including first and second simulators, the method further comprising the steps of:

causing the first simulator to receive sensor information transmitted from the second simulator to ~~a main body side~~ the mechanism control program; and

causing the first simulator to operate in synchronism with the second simulator on the basis of the received sensor information.

28. (Cancelled)

29. (Currently Amended) A ~~simulation method of simulating operation on a unit side in an apparatus which transmits command information from a main body side to the unit side, transmits an execution result of the command from the unit side to the main body side as a response, and transmits sensor information on the unit side to the main body side, for debugging a mechanism control program, the mechanism control program being used for controlling a mechanism which performs a mechanical operation and a hardware which drives and controls the mechanism, the simulation method comprising the steps of:~~

~~holding command information transmitted from said main body side via a first series and command information transmitted from said main body via a second series in a state read-accessible from a unit side CPU; and~~

~~transmitting sensor information and response information written by the unit side CPU to said main body side via said first series,~~

writing first command information in a first command information storing section based on a first mechanism control program, the command information being used for driving and controlling the mechanism and being readable by a simulation CPU;

reading the first command information from the first command information storing section using the simulation CPU;

simulating an operation of the mechanism and the hardware used to drive and control the mechanism, when the first command information is read out;

writing sensor information in the sensor information storing section, the sensor information being obtained as an operation result of the mechanism when simulation is performed, and being readable by the first mechanism control program;

writing response information in a response information storing section, the response information indicating an operation result of the simulating operation and being readable by the first mechanism control program;

writing second command information in a second command information storing section based on the second mechanism control program different from the first mechanism control program, the second command information being used to drive and control the mechanism, and being readable by the simulation CPU; and

monitoring the second command information provided by the second mechanism control program, the monitoring being performed when the second command information is read from the second command information storing section by the simulation CPU.

30. (Currently Amended) A ~~simulation~~ method according to claim 14, wherein said method is applied to a simulation system including first and second simulators and a main body, the method further comprising the steps of:

~~causing the first simulator to receive sensor information transmitted from the second simulator to said main body side via a second series;~~

causing the first simulator to operate in synchronism with the second simulator on the basis of the ~~received~~ sensor information;

~~causing the second simulator to receive sensor information transmitted from the first simulator to said main body side via a first series; and~~

causing the second simulator to operate in synchronism with the first simulator on the basis of the ~~received~~ sensor information.

31. (Cancelled)